

# Memorandum

To: Chairman and Commissioners

Date: May 2, 2004

From: Diane C. Eidam

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Action

Ref: **Draft Environmental Impact Report/Environmental Assessment (DEIR) for the Caltrain Electrification Program from San Francisco to Gilroy**

## **Issue:**

Should the Commission comment on the Draft Environmental Impact Report/Environmental Assessment (DEIR) for the Caltrain Electrification Program from San Francisco to Gilroy by the Peninsula Corridor Joint Powers Board (JPB)?

## **Recommendation:**

The DEIR states that it the JPB has the financial capacity to build and operate Option1 of the Caltrain Electrification project from San Francisco to Gilroy. Beyond Option 1, an additional \$29 to \$411 million would be needed to fund the other options.

Staff recommends that the Commission, as a responsible agency, make the following comment on the DEIR:

- The JPB should ensure if the other options are selected that the revenues are identified to fully fund those options.

## **Background:**

Commute traffic between the major employment centers between San Francisco and the Peninsula is growing. Reverse commute is increasing between San Francisco and the Peninsula. Off peak travel is also increasing. The JPB considered providing increased service with diesel or electric motive power, but concluded that electrification was the desirable course to take. The JPB proposes to electrify the entire 77-mile corridor from San Francisco to Gilroy. It would require between 180 to 200 single-track miles of overhead wire to power the rail line.

The DEIR states that electrification would:

- permit the use of electric trains that can accelerate and decelerate at better rates than diesel powered trains. The faster acceleration and deceleration would permit the JPB to reduce the travel time of its trains, as well as increase their frequency.
- result in the reduction of train noise due to diesel locomotives.
- attract more riders and thereby reduce automobile use and emissions. Diesel emissions from diesel locomotives would be greatly reduced, since the number diesels would be greatly reduced.
- better address the Peninsula commuters' vision of environmentally friendly, fast and reliable service.

**No Electrification (No Project) Alternative:** This alternative would incorporate the proposed series of rehabilitation improvements, enhancements, and additions to the system, not including electrification to provide improved service, as envisioned in the adopted 1999 Rapid Rail Program. This alternative also assumes that the service level would increase as planned by the JPB from 80-trains/ day in 2001 to 98 trains/day by 2008 to 132 trains/day by 2020.

**Electrification Program Alternative:** The Electrification Alternative provide for the conversion from diesel to electric-hauled trains. Limited freight and certain diesel passenger service could continue operating. Electric rolling stock could

consist of electric multiple unit (EMU) or electric locomotives. If project were completed and service were to begin in 2008, the estimated capital cost for this alternative ranges from \$602 million to \$866 million, depending upon the type and number of rolling stock selected. The base cost for the electrification of the trackway and related improvements is about \$457 million, while the type and number of rolling stock ranges from \$145 million to \$409 million. The estimated cost for each option under this alternative is shown in the chart below.

<b>Capital and Operating Cost Estimates</b> <i>(Costs in Millions – 2003 Dollars)</i>			
Electrification Option/Year	Rolling Stock	Non-Rolling Stock	Electrification Total
<b>2008 (98 trains/weekday)</b>			
Option 1: Replace Diesel Locomotives	\$145.12	\$456.69	<b>\$601.81</b>
Option 2: Electric Multiple Units	\$373.71	\$456.69	<b>\$630.40</b>
Option 3: Replace Diesel Locomotives & Passenger Cars	\$408.91	\$456.69	<b>\$865.60</b>
<b>2020 (132 trains/weekday)</b>			
Option 1: Replace Diesel Locomotives	\$211.65	\$456.69	<b>\$668.34</b>
Option 2: Electric Multiple Units	\$467.16	\$456.69	<b>\$923.85</b>
Option 3: Replace Diesel Locomotives & Passenger Cars	\$555.72	\$456.69	<b>\$1,012.41</b>
<b>Annual Operating Costs</b>			
	<b>2008</b>	<b>2020</b>	
	\$86.0 to \$86.9	\$109.9 to \$111.1	

Funding for Electrification Program Alternative: The funding of the proposed Electrification Program Alternative, according to the DEIR, would come from:

Funding Sources for Caltrain Electrification Program (Millions)	
Source	Amount
County Sales Tax	\$345
RTIP/STP/CMAQ	\$ 47
Other Local Sources	\$ 95
Inter-Regional TIP	\$ 65
California Air Resources Board	\$ 50
<b>TOTAL</b>	<b>\$602</b>

Assuming the revenues are available, only the 2008 Electrification Program Alternative, Option 1 can be fully funded. The other options would require additional funding ranging from about \$29 to \$411 million to be fully funded within the timeframe proposed.

**Environmental Impacts:** Attached to this memo is the DEIR Executive Summary that identifies the significant impacts resulting from the proposed Electrification alternative. In summary, the DEIR states that the impacts are minimal or can be mitigated.

## SUMMARY

### S.1 PURPOSE OF AND NEED FOR CALTRAIN ELECTRIFICATION PROGRAM

The primary purposes of the Caltrain Electrification Program are to:

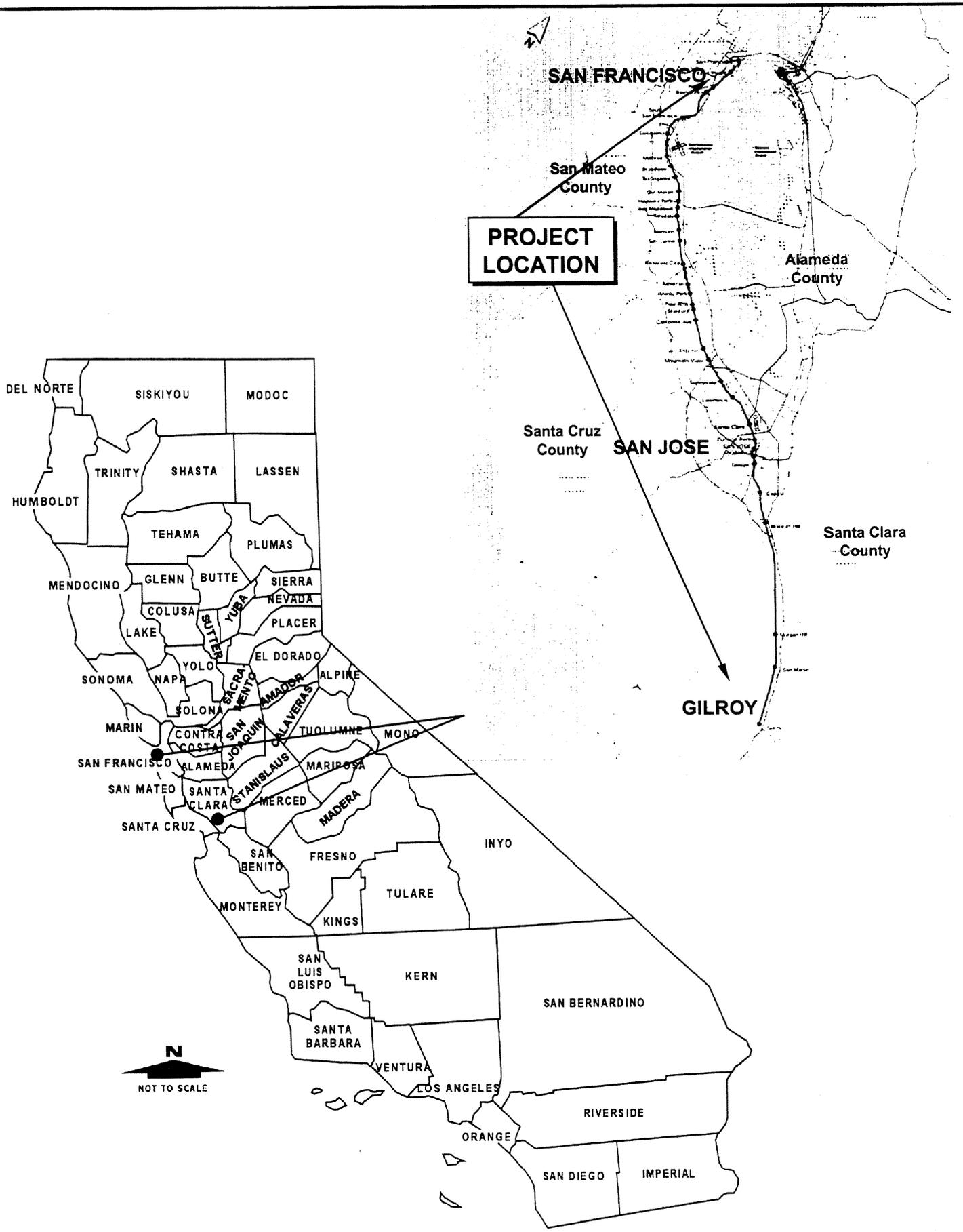
- Improve train performance,
- Reduce noise,
- Improve regional air quality, and
- Modernize Caltrain.

Figure S-1 shows the location of the proposed project.

The population of the Bay Area is increasing and, with it, traffic congestion. Commute traffic between major employment centers in San Francisco and along the San Francisco Peninsula is growing, and there has been a substantial increase in “reverse commute” trips from San Francisco to Peninsula locations over the past decade. Off-peak travel between San Francisco and Peninsula locations is also on the rise. Caltrain has experienced increases in ridership, as people seek alternate ways to meet these travel needs. Caltrain anticipates continued increases in demand for its rail services between now and the year 2020. To meet that increasing demand, Caltrain adopted the Rapid Rail Program and is already implementing increases in trackage; Caltrain is also planning to operate more trains, running at higher speeds, and is considering investments in additional rolling stock.

It would be possible for Caltrain to provide increased service levels using either diesel or electric motive power. Electrification, however, offers several advantages in comparison with diesel power, and these benefits serve the primary objectives of the Caltrain Electrification Program, as follows:

- Electric trains can accelerate and decelerate at better rates than diesel powered trains, even with longer train consists. Given Caltrain’s close-set station stops, a substantial portion of a Caltrain trip is spent accelerating and decelerating between stations. This would be expected to increase under continued diesel operations, as train consists get longer. Thus, electric trains can provide real travel time reductions and improve the overall system by increasing capacity and allowing increased levels of service. These travel time savings are expected to stimulate additional ridership, reducing vehicle



**Figure S-1**  
**PROJECT LOCATION**  
**CALTRAIN ELECTRIFICATION PROGRAM**

miles of travel and congestion on Peninsula roadways. Reducing auto use would also improve regional air quality and reduce parking demand in downtown San Francisco and Peninsula cities.<sup>1</sup>

- Noise emanating from the passage of electrified train sets is measurably less when compared with diesel operations. With the very substantial increases in peak and off-peak Caltrain service that are either underway or planned for implementation during the next five to 15 years, electrification becomes an important consideration for reducing noise of train pass-bys and maintaining Peninsula quality of life. Train whistles will continue to be sounded at grade crossings, consistent with Public Utilities Commission safety regulations.
- In addition to the air quality benefits of reducing automobile use for commuting by increasing rail ridership, electrified locomotives are expected to produce reductions in corridor air pollution emissions when compared with diesel locomotives. This holds true even when the remote generation and transmission of electric power is considered.
- An electrified Caltrain system would better address Peninsula commuters' vision of an environmentally friendly, fast, reliable service. This also may stimulate ridership. Additionally, an electrified Caltrain system would set the stage for an expanded modern regional electric express service and, potentially, for a statewide high-speed rail service as well. It is anticipated that any high-speed rail service would be fully electrified. The Electrification Program facilities would be designed to accommodate high-speed rail service as well as Caltrain and freight service.

## S.2 ALTERNATIVES

Two alternatives are evaluated in this Environmental Assessment / Environmental Impact Report: the No-Electrification (No-Project) Alternative and the Electrification Program Alternative. The Electrification Program Alternative includes alternative rolling stock types as options.

### S.2.1 THE NO-ELECTRIFICATION (NO-PROJECT) ALTERNATIVE

The No-Electrification Alternative constitutes the No-Project Alternative for the purposes of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

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<sup>1</sup> The Electrification Program identifies the requirement for the existing signal system equipment to be modified/replaced as required for electrification compatibility. In addition, the "Constant Warning" at the grade crossings will have to be replaced with an electrification-compatible system as part of the program. This is anticipated to avoid any increase in "gate-down time" that may be associated with electric rail systems' incompatibility with signal system equipment.

## **SUMMARY**

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The No-Electrification (or No-Project) Alternative incorporates a series of rehabilitation improvements, enhancements and additions to the existing system, not including electrification, that would provide an improved level of service. These improvements will generally be carried out within the existing JPB- or UPRR-owned railroad rights-of-way and environmental and other issues will be addressed separately in accordance with applicable environmental requirements.

The No-Electrification Alternative assumes that the following Caltrain facilities will exist at the completion of the Caltrain Express (CTX) project (formerly known as the "Bonanza" and "Baby Bullet" project), consistent with the Rapid Rail Program adopted by the JPB in 1999:

- Rehabilitation of the Existing System – long-term repairs, reconstruction and modernization of the existing tracks, signals, bridges, stations, rolling stock and other systems.
- Enhancements and Capacity Improvements – additions and betterments to the rail system including additional main and passing tracks to facilitate train meets and passes; enhanced signal and communications systems (centralized train control [CTC] that can accommodate an upgrade to automatic train control [ATC], and fiber optics); modernized stations; a new centralized equipment maintenance and operations facility (CEMOF) comprising maintenance shop, buildings and support facilities at the Lenzen site in San Jose; vehicular and pedestrian grade separations; and additional rolling stock. Also included in this category are grade crossing and station closures and consolidations.
- New CTX service consisting of 10 express trains per day with projected 57-minute travel times between San Francisco and San Jose by early 2004.
- A variety of passenger station improvements to permit simpler ticketing arrangements and create improved station amenities.

Additional proposed increases in Caltrain's service level to provide 98 daily trains in the San Francisco to San Jose segment (including eight daily trains in the San Jose to Gilroy segment) by the year 2008 and 132 daily trains (including 20 trains in the San Jose to Gilroy segment) by the year 2020 are being studied and are also included in the No-Electrification Alternative.

### **S.2.2 THE ELECTRIFICATION PROGRAM ALTERNATIVE**

The Electrification Program Alternative would provide for the conversion from diesel-hauled to electric-hauled trains and would require the installation of some 180 to 200 single-track miles of overhead contact system (OCS) for the distribution of electrical power to the electric rolling stock. Some limited diesel operations for certain passenger routes, as well as for freight service, would continue. Electric rolling stock would consist of electric locomotives or electric multiple unit (EMU) cars, as discussed in Section 2.3.2.5, Rolling Stock. The OCS would be powered

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from a 25 kilovolt (kV), 60 Hertz (Hz), single-phase, alternating current (ac) supply system consisting of traction power supply substations, switching stations, and paralleling stations.

### **S.2.2.1 Overhead Contact System**

The overhead contact system (OCS) would provide power to the electric vehicles. For heavy-haul commuter rail systems, such as that operated by Caltrain, the voltage of choice today throughout Europe and the rest of the world is 25 kV at commercial frequencies (50-60 Hz), and this is the voltage proposed for the Electrification Program Alternative.

This power supply and distribution system and voltage are compatible with the requirements of high-speed rail and will, therefore, accommodate future development of high-speed rail in the Caltrain corridor without any significant overhaul of the electrification system.

A mainline OCS typically comprises two conductors above each track in what is known as a catenary configuration: a messenger wire that sags between support points (much like a utility transmission line), below which a contact wire is suspended. Both main wires are energized and are part of the same circuit. The pantograph, mounted on top of the electric vehicles, slides under the contact wire and collects the traction current from it.

The messenger wire is supported by means of cantilevered, hinged bracket arms that extend horizontally over the track from vertical steel poles mounted clear of the dynamic envelope of the vehicles. These poles must be placed within 10 to 12 feet of the centerline of the tracks they serve. In complex areas, where there is limited clearance between tracks, multi-track support structures, such as multi-wire headspans attached to taller steel poles, are employed. The poles themselves are supported by cast-in-place concrete foundations or driven pile footings, which are typically set back about 10 to 12 feet from the track centerline. Depending upon the clearance requirements of particular sections of the route, the contact wire height would vary from about 17.6 feet to 23.5 feet.

Clearances for maintenance and operation of the overhead contact system will be designed to allow for existing railroad freight clearances and operations; the overhead contact system, however, may have to be de-energized at some overhead bridge locations in order to operate certain freight trains over the JPB-owned right-of-way during non-passenger revenue hours. OCS installation on the segments of the UPRR-owned right-of-way would be designed to provide clearance parameters to permit American Association of Railroads (AAR) Plate H freight operations at all times under the energized conductors. (See Figures 2.3-1 through 2.3-3).

Figures 2.3-1 and 2.3-2 show typical center and side cantilever bracket arms and poles for two-track sections. Figure 2.3-3 shows a typical headspan structure for multi-track sections. Figure 2.3-4 shows a portal arrangement, where the central wires are supported over multiple tracks by means of a solid steel support.

### **S.2.2.2 Auto-Transformer Power Feed Arrangement**

The auto-transformer power feed system arrangement would require the installation of only three traction power supply substations, also referred to as primary substations, spaced between 29 and 37 miles apart. In addition, there would be two switching stations and eight paralleling stations, about three to eight miles apart. The paralleling stations provide additional power support to the power distribution system and permit increased spacing of the primary substations. Figures 2.3-5 to 2.3-20 show the proposed locations for these traction power facilities. Alternate sites are under consideration for several facilities and all are evaluated in the present document. In each case, JPB would first seek to purchase the site labeled as "A," and would consider the alternative sites (labeled "B" and "C") in order if the previous lettered site could not be obtained.

In addition to reducing the number of large primary substations, another advantage of the auto-transformer feed arrangement for implementation along the Caltrain corridor is its potential to reduce electromagnetic fields (EMF) and electromagnetic interference (EMI) because it includes two parallel aerial feeders, one on each side of the alignment. The currents in the parallel feeders flow in the opposite direction to that in the main catenary conductors and this tends to cancel EMF/EMI effects created by current flow in the main OCS.

### **S.2.2.3 Substations, Switching Stations, and Paralleling Stations**

The primary substation compounds would be about 115 feet by 200 feet in size, as evidenced by the size of the facilities recently installed between New Haven, Connecticut and Boston, Massachusetts for the 25 kV ac extension of the electrified services on the Amtrak Northeast Corridor. Lineside equipment would be designed to provide for alternate feeding arrangements in the event of a substation equipment outage. Figure 2.3-21 shows a typical substation installation.

At approximately the midpoint between substations, switching stations would be installed, and in between the substations and switching stations, paralleling stations would be installed to permit increased spacing of the primary substations. Switching station and paralleling station compound dimensions are typically about 35 feet by 125 feet. Figure 2.3-24 shows a typical switching station compound.

Substation facilities would be placed to take advantage of connections to existing power sources and away from residential and habitat areas. The smaller paralleling and switching station facilities would be located to minimize their impact on residential and habitat areas.

### **S.2.2.4 Overbridge Protection Structures**

In addition to the electrical facilities themselves, electrification of the Caltrain line would require the construction or enhancement of overbridge protection barriers on 53 roadway bridges that cross over the Caltrain alignment. As shown in Table 2.3-2 in Section 2.3.2.4, 17 of the existing bridges that cross over the Caltrain corridor already have such barriers. These overbridge

protection barriers prohibit access to the rail corridor and prevent objects from being thrown off the bridges in a manner that would damage or interfere with the electrical facilities. New overbridge protection barriers would be 6.5 feet high and from 35 to 80 feet long, depending on the number of tracks within the railroad corridor underneath. The existing barriers would be enhanced to meet these requirements.

Overbridge protection barriers can be constructed from a variety of materials, including timber, sheet metal, small mesh wire fabric, and concrete. Figure 2.3-25 shows a typical overbridge protection barrier treatment. It is proposed to use a fine mesh wire fabric for the Electrification Program Alternative; this provides safety protection and maintainability, but affords a measure of transparency for the motorist.

#### S.2.2.5 Rolling Stock

The Electrification Program Alternative includes three different rolling stock options, as described below. With any of the options, power for the electric vehicles will be drawn from the overhead contact system (OCS) through a roof-mounted pantograph. The pantograph is a hinged, mechanical device that can extend vertically to follow variations in the OCS contact wire height, with a typical extension from as low as 14 feet up to 24 or 25 feet. A typical pantograph is depicted in Figure 2.3-26.

All three options are being evaluated to produce recommendations that will cover Caltrain's short- and long-term needs for rolling stock.

1. The first option would replace the existing diesel locomotive fleet on a one-for-one basis and would result in electric locomotives hauling the existing fleet of gallery cars.
2. The second option would replace the diesel locomotives and all of the gallery cars with electric multiple units (EMUs). With EMUs, each motorcar has its own pantograph mounted on the roof, and separate electric motor drives to each axle of the trucks, using four motors (one per axle) or two motors (one per truck). EMUs can be operated in a variety of train consists, dependent upon the requirements of the rail system operator.
3. The third option would replace the diesel locomotives and all of the gallery cars with electric locomotives hauling a completely new fleet of multi-level trailer cars.

All three options would retain a limited amount of diesel service for certain passenger routes such as the Dumbarton or Salinas, for emergencies, and for railroad freight operations.

**Electric Locomotives.** Electric locomotives currently in passenger service on Amtrak's Northeast Corridor and used by New Jersey Transit (NJT), SEPTA (Southeastern Pennsylvania Transportation Authority) and MARC (Maryland Rail Commuter Service) include the AEM-7 manufactured by ASEA and the Electric-Motive Division of General Motors; the ASEA ALP-44, the Bombardier high horsepower (HHP) locomotive; the older freight-based General

Electric E-60, and the ADtranz ALP-46 locomotive. These locomotives are shown in Figure 2.3-27. The design locomotive for evaluation of the impacts of electrification in the present document is the ADtranz ALP-46.

**Electric Multiple Units.** EMUs currently in use include the 1500-volt dc gallery cars now being operated by Metra in Chicago, but originally by the Illinois and Central Gulf Railroad (ICG). These cars closely resemble the Caltrain double-level gallery cars. 25 kV ac single-level EMUs are in service on the Deux Montagnes Commuter Railroad in Montreal. Typical modern European EMU vehicles are shown in Figure 2.3-28. There is no prototype for the bi-directional EMU proposed for the Electrification Program Alternative. The EMU vehicle that would be proposed for the Electrification Program would be a multi-level car of comparable dimensions to the existing Caltrain gallery car. Currently, there is no production vehicle of this type that would satisfy the recently established FRA strength requirements. This vehicle would have to be specially procured and designed.

#### **S.2.2.6 Caltrain Operating Scenario(s) Under Electrification**

The level of Caltrain operations and therefore fleet requirements under the Electrification Program Alternative would be the same as described under the No-Electrification Alternative, with 98 trains per day, including eight trains in the San Jose to Gilroy segment, by 2008, and 132 trains per day, including 20 trains in the San Jose to Gilroy segment, by 2020.

Caltrain would continue to operate diesel locomotives for the planned Dumbarton Rail service and for the proposed Monterey-Salinas Rail service. Also, some diesel locomotives would be retained for emergencies affecting electrified operations.

#### **S.2.2.7 Modification or Replacement of Signal System**

The Electrification Program has identified the need to modify or replace the existing signal system equipment to achieve electrification compatibility. This applies particularly to grade crossing protection systems, where the "Constant Warning Time" equipment would have to be replaced with an electrification-compatible system to avoid increased crossing gate down times, particularly in locations where multiple grade crossings are in close proximity. Caltrain is considering a pilot project to test new technology that incorporates the use of wayside radio equipment that will communicate with equipment on board the locomotives and cab cars. This technology would be compatible with both diesel and electrified operations and would therefore also permit reductions in gate down times for the existing diesel service.

### **S.2.2.8 Other Improvements Included in the Electrification Program Alternative**

OCS infrastructure would be placed to facilitate proposed third and fourth track improvements in the corridor segment from Bayshore to Brisbane, in the vicinity of the new Millbrae Station, and in the areas designated as Redwood Junction Improvements and Lawrence-Santa Clara Improvements.

Construction has begun for the new central equipment maintenance and operation facility (CEMOF) at the Lenzen Yard; completion is expected in 2006. The CEMOF has independent utility and purpose from the Electrification Program, as it would serve current and future system operations whether they are diesel or electric. The CEMOF was the subject of a separate environmental document; a Finding of No Significant Impact was given by FTA in March 1999. The Electrification Program Alternative would provide the required OCS wiring of the shop and tracks within the CEMOF.

### **S.2.2.9 Staging of Electrification Improvements**

The intent of the Electrification Program is to wire the existing trackwork, together with that proposed under the CTX project, from San Francisco to Gilroy. In practice, this construction may occur in two phases: the first phase is likely to provide for construction from Tamien in San Jose to San Francisco and the second phase from Tamien to Gilroy. The staging of electrification from Tamien to Gilroy is contingent upon negotiations with the UPRR.

### **S.2.2.10 Alternatives Considered and Withdrawn**

A range of different propulsion options was considered to meet the project purpose and need. Four alternatives were ultimately withdrawn from further consideration based on low cost-effectiveness, environmental effects, potential project delays, or other factors. These alternatives and the reasons why they were withdrawn are presented in Section 2.4, Alternatives Considered and Withdrawn.

## **S.3 SUMMARY OF ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES**

Long-term environmental impacts of the Caltrain Electrification Program and proposed mitigation measures are summarized in Table S-1. Short-term, temporary construction-phase impacts and proposed mitigation measures are summarized in Table S-2. Full descriptions of these impacts are provided in Chapters 3 and 4, respectively.

**Table S-1: Summary of Long-Term Impacts and Proposed Mitigation Measures**

Impact Category/ Section in EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
<b>Aesthetics</b> Section 3.1	No impact	Addition of OCS poles and wires and trimming of trees in an existing commuter and freight rail corridor would result in changes that would increase visual clutter in some locations and be perceived as negative by some residents and business occupants, depending upon their distance from the Caltrain right-of-way and the amount of visual screening present. These changes would not introduce visual elements that are substantially out of character with existing land uses or obscure a scenic view or vista. Mitigation measures include use of head spans to lighten overhead elements in sensitive areas, coordinating with local jurisdictions and neighborhoods to incorporate aesthetic treatments for OCS poles, and directing light associated with proposed traction power facilities onto the premises and away from surrounding land uses.
<b>Agricultural Resources</b> Section 3.2	No impact	0.53 acres of land currently in agricultural use would be required for traction power facilities. ATF-3 is entirely covered by Williamson Act contract and requires special notifications and approvals before it may be used for non-agricultural purposes. An alternative site would provide the same acreage, but is not covered the Williamson Act contract. Form AD-1006 has been submitted to and returned by NRCs. Total site assessment criteria scores for ATF-3 and ATF-3 (alternate), are 177 and 157, respectively. Therefore, Caltrain would pursue site ATF-3 (alternate) and would consider ATF-3 only if conditions prevent purchase of ATF-3 (alternate).
<b>Air Quality</b> Section 3.3	Bay Area Air Quality Management District (BAAQMD) criteria for reactive organic gases (ROG), nitrogen oxides (NO <sub>x</sub> ) and particulates (PM <sub>10</sub> ) would be exceeded under diesel train operations in forecast years 2008 and 2020.	Electric power generation emissions in 2008 and 2020 would exceed only the NO <sub>x</sub> significance threshold. For both future years the estimated air pollutant emissions, including NO <sub>x</sub> , would be significantly lower than those estimated for existing 2001 diesel train operations. Although there would be increases in motor vehicle use to and from stations from the increase in train ridership under the Electrification Program Alternative, this would be more than offset by the overall reduction in total vehicle miles of travel in the region.

Table S-1: Summary of Long-Term Impacts and Proposed Mitigation Measures

Impact Category/ Section in EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
<b>Biological Resources</b> Section 3.4	No impact	No impacts to wetlands/waters of the U.S. or to habitat for special status species. Pre-construction surveys and other preventive measures would ensure no incidental take of special status species that have moderate potential to occur within the Caltrain corridor.
<b>Cultural Resources</b> Section 3.5	No impact	<b>Historical:</b> No adverse impact to 24 properties either eligible for or appearing to meet eligibility criteria for the NRHP. <b>Archaeological:</b> Excavation for OCS pole foundations may encounter buried cultural resources. Avoidance measures would apply to all sites and sensitive zones; for sites that cannot be avoided testing is recommended. Construction within sites and sensitive zones would use the on-track equipment scenario for OCS pole foundations. If buried cultural resources are discovered, work would stop until an archaeologist assesses significance.
<b>Geology, Soils and Seismicity</b> Section 3.6	No impact	No impact. All project facilities would be designed in accordance with current seismic design criteria.
<b>Hazards and Hazardous Materials</b> Section 3.7	No impact	A total of 45 known or potential hazardous waste sites were identified within ¼ mile of the proposed traction power facility locations. A mitigation plan would be developed to establish guidelines for the disposal of contaminated soil and discharge of contaminated dewatering effluent, and to generate data to address potential human health and safety issues.
<b>Hydrology, Floodplain and Water Quality</b> Section 3.8	No hydrology or floodplain impacts. Water Quality impacts greater than Electrification Program Alternative due to associated exhaust from diesel-powered locomotives.	While constructing OCS pole foundations, groundwater would be encountered in areas where the groundwater table is less than 15 feet below the surface. This will include areas in the vicinity of San Francisco Bay in San Francisco, San Mateo, and Santa Clara Counties. Mitigation measures to avoid pollution of groundwater are proposed; see Section 3.8.3.
<b>Land Use and Planning</b> Section 3.9	No impact	No adverse impact. This alternative is consistent with local planning. No impact on community cohesion. All traction power facilities are proposed to be sited in areas currently zoned for, or in, industrial, transportation, or agricultural use.

**Table S-1: Summary of Long-Term Impacts and Proposed Mitigation Measures**

Impact Category/ Section in EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
<b>Mineral and Energy Resources</b> Section 3.10	<p>The No-Electrification Alternative would consume approximately three times the energy consumed by the Electrification Program Alternative.</p>	<p>The Electrification Program Alternative (all three rolling stock options) would consume approximately one-third of the energy consumed by No-Electrification Alternative. The difference in energy consumption can be attributed to the relative efficiency of electric-powered vehicles and the relative inefficiency of diesel-powered vehicles.</p>
<b>Noise and Vibration</b> Section 3.11	<p><b>Train Noise.</b> Based on FTA noise criteria 705 single-family residences and 157 multi-family residences would experience noise at FTA “Impact” level and 626 single-family residences and 179 multi-family residences would experience noise at FTA “Severe Impact” level.</p>	<p><b>Train Noise.</b> There would be reductions in the numbers of residences experiencing noise impacts compared to the No-Electrification Alternative. <u>Rolling Stock Option 1:</u> 625 single-family residences and 202 multi-family residences would experience noise at the FTA “Impact” level; 221 single-family residences and 51 multi-family residences would experience noise at the FTA “Severe Impact” level (reductions of 4 percent in “Impacts” and 66 percent in “Severe Impacts,” respectively, compared with the No-Electrification Alternative). JPB would continue to investigate abatement measures to address the remaining effects.</p> <p><u>Rolling Stock Option 2:</u> 737 single-family residences and 138 multi-family residences would experience noise at FTA “Impact” level and 480 single-family residences and 155 multi-family residences would experience noise at FTA “Severe Impact” level (increase of two percent and reductions of 21 percent respectively, compared to No-Electrification). JPB would continue to investigate abatement measures to address the remaining effects.</p> <p><u>Rolling Stock Option 3:</u> No single-family residences and multi-family residences would experience noise at FTA “Impact” and “Severe Impact.” This represents a 100 percent reduction of Impact level effects at single-family residences and a 100 percent reduction of all other train noise impacts.</p>

Table S-1: Summary of Long-Term Impacts and Proposed Mitigation Measures

Impact Category/ Section in EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
Noise and Vibration (cont'd) Section 3.11	<p><b>Substation Noise.</b> No impact.</p> <p><b>Vibration.</b> Based on FTA vibration criteria, impacts would occur at 2550 representative sensitive receptors.</p>	<p><b>Substation Noise.</b> Four paralleling stations and one switching station would be within 180 to 250 feet of residences. Depending on substation layouts, noise could affect residences. Mitigation measures for impacts of traction power substation noise would include the use of enclosures and adjustments to ventilation systems.</p> <p><b>Vibration.</b> Rolling Stock Options 1 and 3: same as No-Electrification Alternative. Rolling Stock Option 2: Impacts would occur at 486 representative sensitive receptors (an 81 percent reduction, compared with No-Electrification).</p>
Population and Housing and Environmental Justice Section 3.12	No impact	No growth inducement impact. No disproportionate beneficial or adverse effects on minority, low-income, or transit-dependent communities. A total of approximately 3.09 acres would be acquired to site and construct traction power stations. No residential properties would be affected, and there would be no displacements of active businesses or employees. Just compensation would be provided as required by law.
Public Services and Facilities Section 3.13	No impact	No adverse impact. Public transportation usage to community events and facilities may be enhanced, decreasing parking demand at these locations.
Recreation Section 3.14	No impact	No adverse impact. Public transportation usage to public parks and recreation facilities may be enhanced, decreasing parking demand at these locations.
Transportation/Traffic Section 3.15	<p>New transit ridership would be lower than under the Electrification Program Alternative.</p> <p>Projected daily riders: 53,800</p>	<p><b>Increased Transit Use.</b> Electrification Program Alternative would result in increased public transit use compared with the No-Electrification Alternative.</p> <p>Projected riders per weekday: 57,918 (an increase of 4,120 riders per day over projected 2020 No-Electrification ridership).</p> <p><b>Decreased Roadway Congestion.</b> Savings of 59,000 vehicle miles of travel (VMT) per day in the U.S. 101 corridor in 2020 due to highway travel time improvements between corridor origins and San Francisco.</p> <p><b>Travel Time Savings.</b> On average, travel time on board Caltrain would be reduced by 3 to 12 percent, depending on length of trip. Savings for selected trips range from 2 to 8 minutes.</p>

**SUMMARY**

**Table S-1: Summary of Long-Term Impacts and Proposed Mitigation Measures**

Impact Category/ Section in EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
<b>Utilities and Service Systems</b> Section 3.16	No impact	No adverse impact. JPB will coordinate with utility providers. Underground utilities that cross the right-of-way would be largely avoided by modifying pole spacing. Underground utilities paralleling the right-of-way will be avoided with headspan arrangement, temporary supports, or incorporating into the OCS pole foundation by encasing in split pipes or tubes. Overhead utilities will be avoided by raising the existing utility wires over OCS wires, and relocated by installing taller poles and transferring existing wires from shorter poles. Some overhead utility crossings will have to be relocated underground. Coordination with providers and advance notice to customers will be undertaken to minimize disruptions.
<b>Electromagnetic Fields</b> Section 3.17	No impact	The Electrification Program Alternative would introduce a new source of electromagnetic fields (EMF), increasing EMF levels on-board Caltrain vehicles, along the perimeter of the ROW, and at various locations that passengers and workers frequent. Projected field strengths are within the "low-frequency" ranges for which scientific studies have determined there is no discernible link to human health effects. Minimal or no associated health risks would result. No mitigation indicated.
<b>Cumulative Impacts</b> Section 3.18	No impact	The Electrification Program Alternative, together with other reasonably foreseeable future projects, would introduce new transportation-related visual elements into the environment and convert small amounts of agricultural land to transportation use. Because of the historic location of transportation corridors and floodplain areas, some encroachment into the 100-year floodplain would be unavoidable. These combined effects would not constitute a substantial adverse impact

**Table S-2: Summary of Construction Impacts and Proposed Mitigation Measures**

Impact Category and Section of the EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
<b>Aesthetics</b> Section 4.2.1	No impact	Visual disruptions from construction activities would be noticeable but temporary in any given location. Some construction would be accomplished at night. The contractor would be required to minimize "spill over" light or glare effects on adjacent areas.
<b>Air Quality</b> Section 4.2.2	No impact	Nitrogen dioxide, carbon monoxide, hydrocarbons, oxides of sulfur, and particulate matters would be emitted from construction equipment and workers' vehicles. Grading and vehicular travel on unpaved areas would disperse particulate matter.  Best management practices, including dust control measures (e.g., watering and covering materials hauled in trucks) will be used to minimize fugitive dust. Construction equipment will be in good working condition to minimize emissions.
<b>Biological Resources</b> Section 4.2.3	No impact	Temporary impacts such as air pollution from dust and construction equipment, increased runoff and soil erosion, and construction noise would be minimized through the use of best management practices. Construction activities may disturb migratory patterns of California red-legged frog, San Francisco garter snake, and Monarch butterfly, and nesting behavior of several swallow species. All sensitive habitat and wetland areas would be identified for avoidance during construction. Pre-construction surveys and avoidance measures would ensure no incidental take of the species.
<b>Cultural and Historical Resources</b> Section 4.2.4	No impact	<b>Archaeological:</b> Construction activities are not expected to disturb buried cultural materials. If buried cultural resources are inadvertently discovered, all work would stop within 100 feet of the area until a qualified archaeologist can assess significance.  <b>Historical:</b> No construction-period adverse impacts are anticipated. Construction workers would be informed in advance of the significance of historic resources within or along the Caltrain corridor. A feasibility study would be conducted in advance of any construction to identify techniques to protect the integrity of the brick lining of Tunnel 4 during crown mining.
<b>Hazardous Wastes</b> Section 4.2.5	No impact	Handling and storage of fuels and other flammable materials during construction would follow California OSHA and local standards. A worker Health and Safety Plan (HSP) would be developed and monitored for implementation.

**Table S-2: Summary of Construction Impacts and Proposed Mitigation Measures**

Impact Category and Section of the EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
<p><b>Water Quality</b> Section 4.2.6</p>	<p>No impact</p>	<p>An increase in the sediment load in stormwater would occur during rainfall events. The project would require a Stormwater Pollution Prevention Plan (SWPPP). Groundwater may be encountered during electric pole excavations.</p> <p>A SWPPP will be prepared and will identify Best Management Practices. Groundwater impacts will be minimized by installing electric pole foundations using the vibration technique, described in Section 4.1. If groundwater is encountered, dewatering would be conducted and contaminated effluent disposed of per applicable regulations.</p>
<p><b>Neighborhoods and Businesses</b> Section 4.2.7</p>	<p>No impact</p>	<p>Construction-phase detours and street closures would not affect the ability of businesses to operate or disrupt neighborhood and community cohesion.</p> <p>Limit street closures and detours of transit and vehicular traffic to one location at a time, with a construction time frame of 24 to 48 hours for each closure. Implement traffic control measures for roadways where impacts would occur for longer periods.</p>
<p><b>Construction Employment</b> Section 4.2.8</p>	<p>No impact</p>	<p>No adverse impact. Construction expenditures would generate approximately 1,400 on-site full-time construction positions (person year equivalents or PYE) and 3,300 total positions (PYE), including direct, indirect, and induced.</p>
<p><b>Noise and Vibration</b> Section 4.2.9</p>	<p>No impact</p>	<p><b>Noise:</b> Impacts requiring mitigation would occur when construction activities come within 60 to 125 feet of residences and remain within that distance for at least an 8-hour period. Proposed mitigation measures are listed in Section 4.2.9.3.</p> <p><b>Vibration:</b> Impacts sufficient to cause annoyance are anticipated at residential locations that are within 40 to 130 feet from the construction activity. No damage to buildings is anticipated. Mitigation would include noise and vibration monitoring to demonstrate compliance with local noise limits, and avoiding unnecessary construction activities during evening, nighttime, and holiday periods.</p>

Table S-2: Summary of Construction Impacts and Proposed Mitigation Measures

Impact Category and Section of the EA/EIR	No-Electrification (No-Project) Alternative	Electrification Program Alternative
Public Services and Facilities Section 4.2.10	No impact	Detours and street closures would not be expected to have substantial adverse effects on public or emergency service delivery or the ability of people to access public facilities. JPB would coordinate with local traffic departments and corridor emergency service providers in developing detour routes and traffic handling plans. Advance notice of street closures and detours would be provided to local jurisdictions, emergency service providers and motorists.
Transportation Effects During Construction Section 4.2.11	No impact	Traffic in the vicinity of the proposed traction power stations or along the route of power conduits to the rail right-of-way could be disrupted. Use of rail vehicles and the rail right-of-way for construction could disrupt normal rail operations. Construction activities for the Electrification Program Alternative are not expected to have any substantial impact on the availability of parking. No impacts to non-motorized traffic other than those affecting general traffic are anticipated.  Mitigation would include the following measures: <ul style="list-style-type: none"> <li>- Construction staging plans will be developed to minimize impacts to roadways.</li> <li>- Coordination with rail dispatch will be required to minimize rail service disruption.</li> <li>- Track closure for construction will be limited to off-peak hours and weekends.</li> <li>- A traffic management plan will be developed.</li> <li>- The public will be provided advance notice of traffic detours and their duration.</li> <li>- Construction crews will follow established safety practices.</li> <li>- Parking areas will be designated for construction workers.</li> </ul>
Utilities Section 4.2.12	No impact.	Interference with existing utility service will be avoided insofar as possible during installations of connections to high-voltage power transmission facilities. Some overhead utilities that cross the Caltrain alignment may need to be relocated underground or unexpected underground utilities may be encountered. Relocations of affected utilities would be undertaken by the utility owner and would require short-term, limited interruptions of service. If unexpected utilities are discovered, OCS pole foundations could be adjusted up to three feet either side of the design location to avoid them. Any service interruptions would be scheduled in advance and notification provided to users.

#### S.4 ESTIMATED CAPITAL COSTS

The estimated capital costs for the Electrification Program Alternative from Fourth and King Streets to Gilroy are summarized in Table S-3. Total capital costs would vary, depending upon the selected rolling stock option, from approximately \$602 million to \$866 million assuming electrified operations would begin in 2008. Costs are in constant year 2003 dollars and are net of the estimated revenues from the sale of surplus equipment. The lower estimate is for Option 1, which replaces the diesel locomotive fleet with electric locomotives and retains the existing passenger car fleet. New bi-level passenger cars would be acquired only to meet 2008 and other future year capacity requirements. The higher estimate is for Option 3, which replaces both the diesel locomotive and gallery car fleet with electric locomotives and bi-level trailer cars. Option 2, which would replace the entire fleet with EMUs, is estimated to cost approximately \$830 million to support initial year 2008 operations.

In addition to rolling stock costs, there are the costs for electrification of the trackway itself plus related improvements. These include traction power supply and OCS delivery systems; signal systems; grade crossing, tunnel and overcrossing improvements; utility modification and relocations; landscape improvements; equipment and storage facilities; and insurance, administration, and other project development costs. Non-rolling stock program costs would not vary substantially regardless of which rolling stock option is selected. They also would not vary with level of service, but would be fully implemented for the first year of electrified Caltrain service. Non-rolling stock improvements are estimated to cost approximately \$457 million.

Both the rolling stock and other system improvement costs include design, development and construction oversight costs.

Table S-3 presents costs for rolling and non-rolling stock elements and total program costs. Costs represent the procurement costs of new rolling stock and electrification improvements. All options assume five existing Caltrain diesel locomotives would be retained for emergency operations, in the event, for example, that electric power is unavailable for train propulsion. Excess diesel locomotives would be sold.<sup>2</sup> It should be noted that program costs for 2020, like 2008, represent total system costs but include rolling stock to support a service level of 132 trains per weekday. The capital cost to attain 132-train service in 2020 is actually the incremental cost of rolling stock compared to 98-train service in 2008. It can be calculated by subtracting year 2008 costs from year 2020 costs.

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<sup>2</sup> The sale of excess diesel locomotives was assumed in the Metropolitan Transportation Commission's calculation of the Electrification Program's Funding.

<b>Table S-3: Electrification System Costs (Millions of 2003 Dollars) Rolling Stock and Non-Rolling Stock by Year</b>			
<b>Electrification Option/Year</b>	<b>Rolling Stock</b>	<b>Non-Rolling Stock</b>	<b>Electrification Total<sup>1</sup></b>
<i>Year 2008 (98 trains/weekday)</i>			
Opt. 1 (Replace Diesel Locomotives)	\$ 145.12	\$ 456.69	\$ 601.81
Opt. 2 (EMUs)	\$ 373.71	\$ 456.69	\$ 630.40
Opt.3 (Replace Diesel Locomotives & Passenger Cars)	\$ 408.91	\$ 456.69	\$ 865.60
<i>Year 2020 (132 trains/weekday)</i>			
Opt.1 (Replace Diesel Locomotives)	\$ 211.65	\$ 456.69	\$ 668.34
Opt. 2 (EMUs)	\$ 467.16	\$ 456.69	\$ 923.85
Opt. 3 (Replace Diesel Locomotives & Passenger Cars)	\$ 555.72	\$ 456.69	\$ 1,012.41
<sup>1</sup> Estimated cost of new rolling stock and non-rolling stock. Source: Parsons Transportation Group, December 2003.			

## S.5 PROJECT'S INCLUSION IN REGIONAL TRANSPORTATION PLAN

The Caltrain Electrification Program is included as one of the top funding priorities in the financially constrained portion ("Track 1") of the Metropolitan Transportation Commission's (MTC) *Regional Transit Expansion Policy: Program of Projects (RTEP)*. The RTEP is the transit expansion element of the 2001 Regional Transportation Plan (RTP). The 2001 RTP, including the RTEP, was adopted by the MTC in December 2001. Therefore, the Caltrain Electrification Program is included in the financially constrained 2001 RTP.

## S.6 PROPOSED FUNDING BY SOURCE

Capital costs of the Caltrain Electrification Program are proposed to be funded from county-based local sources, including county sales taxes; Regional and State Transportation Improvement and Congestion Management-Air Quality (CMAQ) funds; regional discretionary sources, including Interregional Transportation Improvement Program; and State Air Resources Board/Assembly Bill 434 funds. The amounts are shown in Table S-4.

Source	Amount
County Sales Tax	\$345 <sup>1</sup>
RTIP/STP/CMAQ	\$47 <sup>1</sup>
Other Local Sources	\$95 <sup>2</sup>
Interregional Transportation Improvement Program	\$65
California Air Resources Board	\$50
<b>TOTAL</b>	<b>\$602</b>

<sup>1</sup>Sales tax is \$108 million in San Mateo Measure B and \$237 million in Santa Clara Measure A. RTIP/STP/CMAQ funding is the San Francisco share.  
<sup>2</sup> Includes funds from resale of excess diesel locomotives (approximately \$22 million).  
 Source: MTC, *Regional Transit Expansion Policy: Program of Projects*, November 9, 2001.

**S.7 ENVIRONMENTALLY SUPERIOR ALTERNATIVE**

The Electrification Program Alternative is the environmentally superior alternative because it would achieve the following benefits in comparison with the No-Electrification (No-Project) Alternative:

- Fully meets the project purpose and need;
- Increases Caltrain ridership and reduces corridor vehicle miles of travel;
- Improves corridor and regional air quality by eliminating diesel emissions and reducing vehicle miles of travel;
- Reduces noise of Caltrain operations;
- Accommodates future statewide high-speed rail, and
- Addresses Caltrain riders' vision for a modern, upgraded train service.

**S.8 ISSUES TO BE RESOLVED**

Although many local jurisdictions in the Caltrain corridor, a number of organizations, and many individuals have voiced their support for electrification of the Caltrain system, some local entities and individuals have expressed concern regarding the effects of electrification, or are reserving judgment until they can fully assess the relative benefits and impacts of the project. Further detailed negotiations with the UPRR will be required regarding the installation of electrification facilities on the UPRR owned right-of-way from Tamien to Gilroy. There are no other unresolved issues at this time.